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 CENTRAL INTELLIGENCE AGENCY
 INFORMATION FROM
 FOREIGN DOCUMENTS OR RADIO BROADCASTS

CD NO.

50X1-HUM

COUNTRY USSR
 SUBJECT Economic - Machine tools
 HOW PUBLISHED Monthly periodical
 WHERE PUBLISHED Moscow
 DATE PUBLISHED March 1948
 LANGUAGE Russian

DATE OF INFORMATION 1948

DATE DIST. 25 Mar 1950

NO. OF PAGES 2

SUPPLEMENT TO REPORT NO.

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SOURCE Avtomobil', No 3, 1948.ATTACHMENT FOR CUTTING THE STEERING WORM OF A ZIS-5 TRUCK

Eng Maj A. Tarakanovskiy

The special machines required for cutting the complex spiral curve on the steering worm (part No 16-0212) of the ZIS-5 automobile are not readily available in auto repair shops. However, an attachment can be made for this purpose on ordinary universal machine tools.

This attachment was designed by the author in one of the auto repair shops and adapted to a milling machine. It can also be installed on a lathe, but would have to be fitted in a vertical position, mounted on the machine support.

The work piece, that is, the steering worm of the ZIS-5, is a hollow cylinder with a spiral thread on the outer surface. It is made of low-carbon steel 1020. The left-hand spiral of a complex curve is formed while the worm turns around its center at a distance of 68.26 millimeters from the axis of the cutter.

The gear ratio of the worm is 1:15.9. There are 3.27 convolutions on the worm.

The ends of the worm are spherically shaped for ball bearings on which the worm rests while the spirals are being cut.

The figure (appended) shows the principal features of the attachment. A pin (9) is securely fastened to the frame (6) which is mounted on the milling machine table. A gear (8) is put on the pin, being fastened to the frame of the attachment with bolts (7). A rotating plate (12), with two arm brackets (5) installed on it, turns on the pin (9) over the stationary gear (8).

A shaft (2) fits into the arm brackets (5) which turns the worm being machined by means of a tongue which is secured on the flange of the shaft.

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A skew gear (1) is fitted on shaft (2) activating another gear on vertical shaft (11), which goes through rotating plate (12). A pinion (10) is located on the end of shaft (11) which pinion meshes with stationary gear (8). Machining of the worm (3) is done by an end mill which is secured in the head (4) of the milling machine.

When the shaft (2) turns clockwise, the worm blank (3) begins to turn.

The tongue for the worm drive fits into a milled groove at the end of the cylindrical part of the worm. Slits are broached inside the worm which hold it on the guiding shaft.

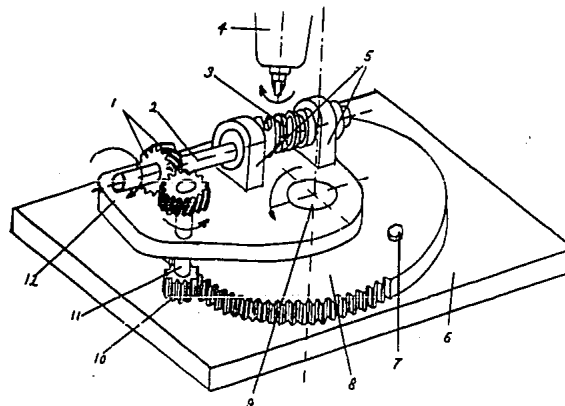
After machining is completed, the worm is case hardened and tempered. Then the spiral is cleaned, polished and copper plated to insure better operation of the steering gear in the initial period of use.

A 0.2-kilowatt, 3-phase, 1440-rpm electric motor is connected through a clutch to a double reduction gear with a gear ratio of 1:3600. The outgoing shaft of the reduction gear is connected by means of a sliding coupling with a gear having 28 teeth. This gear is connected with a gear having 64 teeth, which in turn is joined with the drive shaft of the attachment. The full gear ratio of the drive is

$$\frac{1}{3600} \cdot \frac{28}{64} \approx \frac{1}{8230}$$

The length of the worm spiral on the outer surface is approximately 625 millimeters. This permits a cutting feed of the milling cutter at ~33 millimeters per minute.

The cutting of the steering worm in two rough and one finishing operation, plus the setting up of the attachment and removal of the part, takes 70-75 minutes.



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